

**M.E. (Water Resources & Hydraulic Engg.) Examination (6 Semester), 2024**  
(2<sup>nd</sup> Semester)

**IRRIGATION AND AGRONOMY**  
(Paper - II)

Time : Three Hours

Full Marks : 100

Part – I carries 70 marks and Part – II carries 30 marks.

**Part - I**

Answer any *five* questions from Part - I.

1. a) State the ultimate goal of irrigation.  
 b) If the annual rainfall is 250-500 mm, then which crops can be grown? For such rainfall, is it possible to cultivate high value crops?  
 c) Why is successful cultivation not possible in most parts of the country without the supply of irrigation water?  
 d) What are the ill effects of irrigation?  
 e) What are the scopes of irrigation? Explain briefly.

2+4+2+3+3 = 14

2. a) How can the water lifting be done by manual means?  
 b) What do you mean by flow irrigation?  
 c) Classify the irrigation projects based on the function served and financial returns.  
 d) What is the need for a reconnaissance survey for an irrigation project?  
 e) What are the steps to be followed for the feasibility investigation of an irrigation project?  
 f) Data of which parameters are required during the hydrological investigation of an irrigation project?

2+2+3+2+3+2 = 14

3. a) Define irrigation efficiency.  
 b) How is the suitability of water for irrigation purposes determined?  
 c) Which type of soil retards the growth of crops?  
 d) Prove that the depth of water stored in the root zone in filling the soil upto field capacity is given by  $\frac{d \cdot \gamma_s \cdot F_c}{\gamma_w}$  (in meters). Assume that the area of the soil is 1 m<sup>2</sup>, the depth of the root zone is “*d*” meters, Unit weight of soil =  $\gamma_s$  kg/m<sup>3</sup>, field capacity of the soil is  $F_c$ .  
 e) Differentiate between base period and crop period.

2+3+2+4+3=14

[ Turn over

4. a) What is the purpose of a lysimeter?  
 b) How is the consumptive use of water determined?  
 c) Mention the empirical formula for estimating the monthly consumptive use of water indicating clearly the notations used in the formula.  
 d) After how many days will you apply water to the soil in order to ensure sufficient irrigation of the given crop if the field capacity of the soil is 30% and permanent wilting point is 15%? Density of the soil is 1.5 gm/cc. Effective depth of the root zone is 30 cm, daily consumptive use of water for the given crop is 15 mm. Assume any other data if required.

$$2+3+2+7 = 14$$

5. a) Define the full supply coefficient and capacity factor.  
 b) How is crop growth reduced due to water logging?  
 c) How can poor irrigation management by the cultivators cause water logging?  
 d) What are the remedial measures to prevent water logging?  
 e) State the preventing measures of Preventing measures of salt efflorescence.  
 f) Differentiate between the check basin method and the border strip method.

$$3+2+2+3+2+2 = 14$$

6. a) How are residual and aeolian soils formed?  
 b) What do you mean by soil separates?  
 c) Define light soil, fine soil and medium soil.  
 d) Briefly explain the different types of soil structure.

$$3+2+4+5 = 14$$

7. a) Define apparent specific gravity and true density of soil.  
 b) Define air porosity and effective saturation.  
 c) Derive a relation between mass wetness and volume wetness.  
 d) A soil sample was taken with a core sampler from a field when the soil reached field capacity. The oven dry sample weighed 1.056 kg. The inside diameter of the core was 7.4 cm and the length was 14.9 cm. Determine the bulk density of the soil.

$$4+3+3+4 = 14$$

8. a) Differentiate between the volumetric method and volume metering method.  
 b) Explain the vertical pipe method with a neat sketch.  
 c) Draw the plan and elevation view of a Parshall flume highlighting with components.  
 d) At which condition do the free flow and submerged flow occur in the Parshall flume?

$$4+3+4+3 = 14$$

## Part - II

Answer any *three* questions from Part - II.

8. a) Define the term Agronomy.  
b) What are the broad classifications of crops?  
c) Name two each of positively and negatively charged ions that are either attracted to the soil colloids or remain in soil solution

3+5+2=10

9. a) Define the term 'crop productivity' and discuss factors influencing it  
b) What is water requirement of a crop?  
c) What are the factors that are considered for determining water requirement of crop?

4+3+3=10

10. a) Define soil structure and soil texture.  
b) Briefly describe the soil type and soil profile.  
c) How crop can be classified with respect to place of origin? Give examples

3+4+3=10

11. a) What are the advantages and limitations of fertigation in agricultural practices?  
b) What are the different components of a drip irrigation system?

6+4=10

12. a) What are the causes and effects of waterlogging on the optimum growth and yield of field crops?  
b) Write short notes on  
i) Tensiometer ii) Gypsum block or Electrical resistance blocks

6+4=10